

IN THE CLAIMS

Listing of Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

Claim 1 (original): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant monitoring system, said processor programmed to execute a process including

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments, said plurality of instruments including at least one redundant instrument, said plurality of measured process values including a plurality of temperature measurements obtained during isothermal conditions,

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data,

analyzing a set of remaining data for cross-calibration, and

recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data.

Claim 2 (original): The apparatus of Claim 1 wherein said process step of loading a data set includes selecting a file, loading a set of RTD data, calculating RTD averages from said set of RTD data, loading a set of thermocouple data, calculating thermocouple averages from said set of thermocouple data, and matching timeslices.

Claim 3 (original): The apparatus of Claim 1 wherein said process step of selecting for analysis includes selecting said set of data consisting of a plurality of data points that fall within a specified range and calculating an upper temperature and a lower temperature for at least one region.

Claim 4 (original): The apparatus of Claim 1 wherein said process step of removing said set of deviating data includes calculating an average narrow range standard deviation value, calculating a fluctuation standard deviation value of average narrow range fluctuations, rejecting a timeslice for said fluctuation standard deviation outside a specified range, and matching thermocouple times to RTD times.

Claim 5 (original): The apparatus of Claim 1 wherein said set of data includes a set of RTD data and a set of thermocouple data, said process step of analyzing said set of remaining data includes calculating a set of RTD deviations from said set of RTD data, calculating an average value and a standard deviation value from said set of RTD deviations, calculating a set of thermocouple deviations from said set of thermocouple data, and calculating an average of said set of thermocouple deviations.

Claim 6 (original): The apparatus of Claim 1 wherein said process step of recalibrating a deviating instrument includes calculating new coefficients for said deviating instrument.

Claim 7 (original): The apparatus of Claim 1 wherein said process step of recalibrating a deviating instrument includes calculating a recalibration uncertainty value for said deviating instrument.

Claim 8 (original): The apparatus of Claim 1 wherein said process step of recalibrating a deviating instrument includes calculating resistance versus temperature for said deviating instrument, calculating new coefficients for said deviating instrument, producing a recalibration curve, and calculating a recalibration uncertainty value.

Claim 9 (original): The apparatus of Claim 1 wherein said process executed by said processor further includes providing a user interface for interacting with an operator of said processor.

Claim 10 (original): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data,

analyzing a set of remaining data for cross-calibration of said plurality of instruments, and

recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data, said process step of recalibrating including calculating new coefficients for said deviating instrument and calculating a recalibration uncertainty value for said deviating instrument.

Claim 11 (Previously presented): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments, said plurality of instruments including at least one redundant instrument, said plurality of measured process values obtained during equilibrium conditions,

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data,

analyzing a set of remaining data for cross-calibration of said plurality of instruments, and

recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data, said process step of recalibrating including calculating new coefficients for said deviating instrument and calculating a recalibration uncertainty value for said deviating instrument.

Claim 12 (original): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

selecting for analysis a set of data from said data set, said set of data consisting of a plurality of data points that fall within a specified range,

analyzing a set of remaining data for cross-calibration of said plurality of instruments, and

recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data, said process step of recalibrating including calculating new coefficients for said deviating instrument and calculating a recalibration uncertainty value for said deviating instrument.

Claim 13 (original): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

selecting for analysis a set of data from said data set, said set of data including a set of RTD data and a set of thermocouple data,

removing a set of deviating data from said set of data, and

analyzing a set of remaining data for cross-calibration of said plurality of instruments, said process step of analyzing further including calculating a set of RTD deviations from said set of RTD data, calculating an average value and a standard deviation value from said set of RTD deviations, calculating a set of thermocouple deviations from said set of thermocouple data, and calculating an average of said set of thermocouple deviations.

Claim 14 (cancelled):

Claim 15 (currently amended): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

~~The apparatus of Claim 14~~ wherein said process step of loading a data set includes selecting a file, loading a set of RTD data, calculating RTD averages from said set of RTD data, loading a set of thermocouple data, calculating thermocouple averages from said set of thermocouple data, and matching timeslices.

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data, and

analyzing a set of remaining data for cross-calibration of said plurality of instruments.

Claim 16 (cancelled):

Claim 17 (currently amended): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments. The apparatus of Claim 14 wherein said process step of loading a data set includes removing any outliers from said data set before calculating at least one average from said data set,

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data, and

analyzing a set of remaining data for cross-calibration of said plurality of instruments.

Claims 18-30 (cancelled):

Claim 31 (currently amended): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

selecting for analysis a set of data from said data set, The apparatus of Claim 14 wherein said process executed by said processor further includes,

after said step of analyzing, a step of recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data.

removing a set of deviating data from said set of data, and

analyzing a set of remaining data for cross-calibration of said plurality of instruments.

Claim 32 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating new coefficients for said deviating instrument.

Claim 33 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating new coefficients for said deviating instrument and calculating a recalibration uncertainty value.

Claim 34 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating resistance versus temperature for said deviating instrument, calculating new coefficients for said deviating instrument, calculating a recalibration curve, and calculating a recalibration uncertainty value.

Claim 35 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating a recalibration curve that includes determining a difference between a measured temperature value and a recalibrated temperature value.

Claim 36 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating a recalibration uncertainty value and extrapolating said recalibration uncertainty value to accommodate a limit value.

Claim 37 (original): The apparatus of Claim 31 wherein said process step of recalibrating a deviating instrument includes calculating a recalibration uncertainty value and adjusting a limit value to accommodate said recalibration uncertainty value.

Claim 38 (cancelled):

Claim 39 (currently amended): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

providing a user interface for interacting with an operator of said processor. ~~The apparatus of Claim 38 wherein~~ said step of providing said user interface includes entering a plurality of configuration settings, each of said plurality of configuration settings containing a data value stored by said processor;

loading a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

selecting for analysis a set of data from said data set,

removing a set of deviating data from said set of data, and

analyzing a set of remaining data for cross-calibration of said plurality of instruments.

Claim 40 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes displaying a plurality of configuration settings, each of said plurality of configuration settings containing a data value stored by said processor.

Claim 41 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for printing and displaying a plurality of information associated with said process step of loading a data set.

Claim 42 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for selecting a set of user selected data associated with said process step of selecting for analysis.

Claim 43 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for displaying and printing a plurality of information associated with said process step of removing said set of deviating data.

Claim 44 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for displaying and printing a plurality of information associated with said process step of analyzing said set of remaining data.

Claim 45 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for loading a plurality of information associated with a process step of generating a report.

Claim 46 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for displaying a plurality of information associated with a process step of generating a report.

Claim 47 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for saving a plurality of information associated with a process step of generating a report.

Claim 48 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for printing a plurality of information associated with a process step of generating a report.

Claim 49 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for displaying and printing a plurality of recalibration information associated with said process step of recalibrating a deviating instrument.

Claim 50 (original): The apparatus of Claim 38 wherein said step of providing said user interface includes options for saving a plurality of recalibration information associated with said process step of recalibrating a deviating instrument.

Claim 51 (original): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a processor in communication with a data storage system, said data storage system being a part of a plant computer system, said processor programmed to execute a process including:

retrieving a data set from said data storage system, said data set including a plurality of measured process values from a plurality of instruments,

determining at least one average value from said data set,

determining a set of deviating data from said data set, and

determining new coefficients for any one of said plurality of instruments that produce at least one data point in said set of deviating data.

Claim 52 (original): The apparatus of Claim 51 further including, after said step of retrieving said data set, a process step of sorting said data set.

Claim 53 (original): The apparatus of Claim 51 wherein said plurality of instruments includes at least one redundant instrument

Claim 54 (original): The apparatus of Claim 51 wherein said plurality of measured process values includes a plurality of temperature measurements obtained during isothermal conditions.

Claim 55 (cancelled):

Claim 56 (cancelled):

Claim 57 (original): The computer system of Claim 55 wherein said process executed by said processing unit further includes, after said step of analyzing, a step of removing a set of deviating data from said set of data, said step of removing said set of deviating data includes calculating an average narrow range standard deviation value, calculating a fluctuation standard deviation value of average narrow range fluctuations, rejecting a timeslice for said fluctuation standard deviation outside a specified range, and matching thermocouple times to RTD times.

Claim 58 (original): The computer system of Claim 55 wherein said process executed by said processing unit further includes, after said step of analyzing, a step of recalibrating any one of said plurality of instruments that produce at least one data point in said set of deviating data.

Claim 59 (original): The computer system of Claim 55 wherein said process executed by said processing unit further includes, after said step of analyzing, a step of recalibrating a deviating instrument that includes calculating resistance versus temperature for said deviating instrument, calculating new coefficients for said deviating instrument, calculating a recalibration curve, and calculating a recalibration uncertainty value.

Claim 60 (original): The computer system of Claim 55 wherein said process executed by said processing unit further includes, after said step of analyzing, a step of recalibrating a deviating instrument that includes calculating new coefficients for said deviating instrument.

Claim 61 (original): The computer system of Claim 55 wherein said process executed by said processing unit further includes, after said step of analyzing, a step of recalibrating a deviating instrument that includes calculating a recalibration uncertainty value for said deviating instrument.

Claim 62 (original): The computer system of Claim 55 wherein said process step of loading a data set includes selecting a file, loading a set of RTD data, calculating RTD averages from said set of RTD data, loading a set of thermocouple data, calculating thermocouple averages from said set of thermocouple data, and matching timeslices.

Claim 63 (original): The computer system of Claim 55 wherein said process step of selecting for analysis includes selecting said set of data consisting of a plurality of data points that fall within a specified range and calculating an upper temperature and a lower temperature for at least one region.

Claim 64 (original): The computer system of Claim 55 wherein said set of data includes a set of RTD data and a set of thermocouple data, said process step of analyzing said set of remaining data includes calculating a set of RTD deviations from

said set of RTD data, calculating an average value and a standard deviation value from said set of RTD deviations, calculating a set of thermocouple deviations from said set of thermocouple data, and calculating an average of said set of thermocouple deviations.

Claim 65 (cancelled):

Claim 66 (currently amended): An apparatus for automating cross calibrations of plant instruments, said apparatus comprising:

a means for communicating with a plant monitoring system;

a means for processing;

a means for performing a cross calibration of a plurality of plant instruments;

and

~~The apparatus of Claim 65 further including~~ a means for recalibrating a deviating instrument.

Claims 67-84 (cancelled):

Claim 85 (currently amended): A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for automating cross calibrations of plant instruments, said method comprising:

(a) retrieving a data set from a data storage system, said data storage unit being a part of a plant monitoring system, said data set including a plurality of measured process values from a plurality of RTD instruments;

(b) selecting for analysis a set of data from said data set;

(c) removing a set of deviating data from said set of data;

(d) analyzing a set of remaining data; and

~~The method of Claim 84 further including:~~

(e) recalibrating a deviating instrument, said a deviating instrument being any one of said plurality of instruments that produce at least one data point in said set of deviating data.

Claim 86 (original): The method of Claim 85 wherein said step (e) of recalibrating a deviating instrument includes calculating new coefficients for said deviating instrument.

Claim 87 (original): The method of Claim 85 wherein said step (e) of recalibrating a deviating instrument includes calculating a recalibration uncertainty value for said deviating instrument.

Claim 88 (original): The method of Claim 85 wherein said step (e) of recalibrating a deviating instrument includes calculating resistance versus temperature for said deviating instrument, calculating new coefficients for said deviating instrument, producing a recalibration curve, and calculating a recalibration uncertainty value.

Claim 89 (cancelled):

Claim 90 (cancelled):

Claim 91 (cancelled):

Claim 92 (cancelled):

Claim 93 (Currently amended): Computer readable media tangibly embodying a program of instructions executable by a computer to perform a method of automating cross calibrations of plant instruments, said method comprising:

(a) retrieving a data set from a data storage ~~system unit~~, said data storage unit being a part of a plant monitoring system, said data set including a plurality of measured process values from a plurality of RTD instruments;

(b) selecting for analysis a set of data from said data set;

(c) analyzing a set of remaining data; and

(d) recalibrating any one of said plurality of instruments that produce at least one data point in ~~said a~~ set of deviating data.

Claim 94 (original): The method of Claim 93 further including, after said step (b) selecting for analysis, a step for removing a set of deviating data from said set of data.

Claim 95 (original): The method of Claim 94 wherein said step of removing said set of deviating data includes calculating an average narrow range standard deviation value, calculating a fluctuation standard deviation value of average narrow range fluctuations, rejecting a timeslice for said fluctuation standard deviation outside a specified range, and matching thermocouple times to RTD times.

Claim 96 (original): The method of Claim 93 wherein said step (a) of loading a data set includes selecting a file, loading a set of RTD data, calculating RTD averages from said set of RTD data, loading a set of thermocouple data, calculating thermocouple averages from said set of thermocouple data, and matching timeslices.

Claim 97 (original): The method of Claim 93 wherein said step (b) of selecting for analysis includes selecting said set of data consisting of a plurality of data points that fall within a specified range and calculating an upper temperature and a lower temperature for at least one region.

Claim 98 (original): The method of Claim 93 wherein said set of data includes a set of RTD data and a set of thermocouple data, said step (c) of analyzing said set of remaining data includes calculating a set of RTD deviations from said set of RTD data, calculating an average value and a standard deviation value from said set of RTD deviations, calculating a set of thermocouple deviations from said set of thermocouple data, and calculating an average of said set of thermocouple deviations.

Claim 99 (original): The method of Claim 93 wherein said step (d) of recalibrating a deviating instrument includes calculating new coefficients for said deviating instrument.

Claim 100 (original): The method of Claim 93 wherein said step (d) of recalibrating a deviating instrument includes calculating a recalibration uncertainty value for said deviating instrument.

Claim 101 (original): The method of Claim 93 wherein said step (d) of recalibrating a deviating instrument includes calculating resistance versus temperature for said deviating instrument, calculating new coefficients for said deviating instrument, producing a recalibration curve, and calculating a recalibration uncertainty value.